

# New mechanism points the way to breaking ribosome antibiotic resistance

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Research groups from the University of Groningen have revealed a novel mechanism of ribosome dimerization in the bacterium *Lactococcus lactis* using cryo-electron microscopy. As this dimerization renders ribosomes more resistant to antibiotics, this study provides the necessary structural basis to design new generations of antibiotics. The results are published in *Nature Communications* on Sept. 28.

Antibiotics are the most common medication used to treat microbial infections. Many [antibiotics](#) target intracellular bacterial ribosomes—cellular factories that synthesize proteins—which are essential for bacterial survival and proliferation. When bacteria have an excess of [protein synthesis activity](#), they stall the ribosomes in an inactive dimeric complex (i.e. two copies of ribosomes interact with each other). This so-called hibernating ribosome complex is more resistant to antibiotics.

In a collaborative effort, research groups led by Egbert Boekema, Bert Poolman and Albert Guskov revealed a novel mechanism of ribosome dimerization in the bacterium *Lactococcus lactis* using [cryo-electron microscopy](#). The peculiarity of the mechanism they describe is that it involves a single protein, named HPF<sup>long</sup>, which is able to dimerize on its own and then pull two copies of ribosomes together. The dimeric state of the [ribosome](#) is no longer capable of synthesizing new proteins.

This hibernation mechanism is in a stark contrast with previous studies done in another microorganism, *Escherichia coli*. However, based on a

phylogenetic analysis of the [amino acid sequence](#) of HPF<sup>long</sup>, the researchers conclude that the mechanism they propose is more widespread, since protein HPF<sup>long</sup> is present in nearly all known bacteria. This study provides the necessary structural basis to design new generations of antibiotics targeting hibernating ribosomes.

**More information:** Linda E. Franken et al, A general mechanism of ribosome dimerization revealed by single-particle cryo-electron microscopy, *Nature Communications* (2017). [DOI: 10.1038/s41467-017-00718-x](#)

Provided by University of Groningen

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